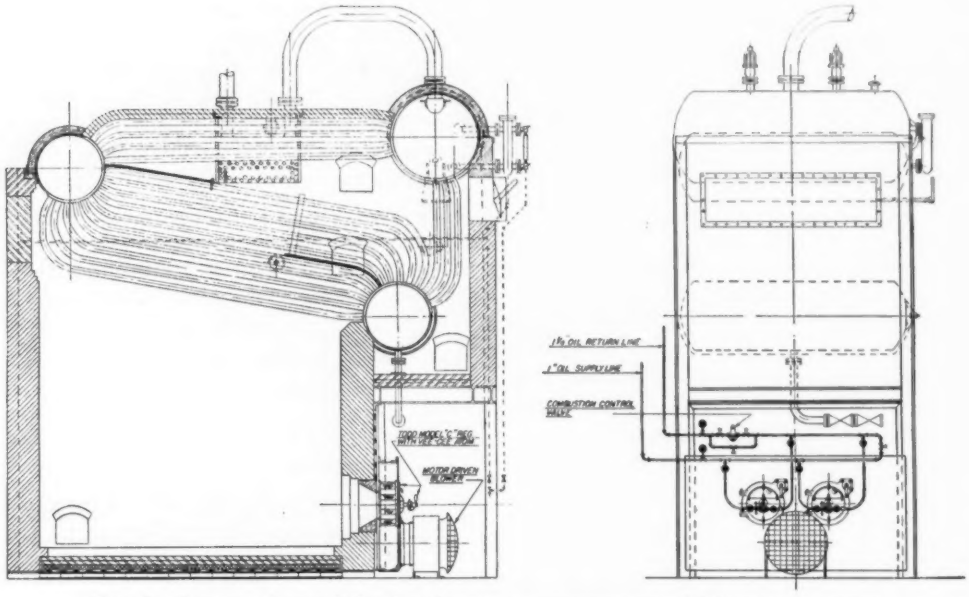


Fig. 2—Section through boiler showing arrangement of firing equipment

equipped with steam-atomizing burners, but in the reconversion mechanical atomization was decided upon, for which purpose Todd "Vee-Cee" variable-capacity return-flow atomizers were selected in order to meet the particular load conditions and take full advantage of automatic combustion control over the wide load range required for the plant's operation. The steam generated is used for operating a turbine-generator, the exhaust from which is employed for process and heating. Demands cover the usual wide span common to such installations.

Fuel Supply and Handling System

The fuel storage consists of two 15,000-gal cylindrical storage tanks. These are buried underground and located so that oil can be delivered by gravity from a railroad tank car or from a motor truck. The tanks are fitted with a steam heating coil for preheating the oil prior to pumping.

The fuel supply system is in duplicate and consists of two pumps—one a steam-driven horizontal duplex type and one a motor-driven rotary, each capable of delivering the fuel to the atomizers at 300 psi. The delivery pressure is maintained by conventional regulating valves. A duplex strainer is fitted in the suction line and a similar high-pressure strainer is installed in the discharge line. The baskets in either strainer can be cleaned without interrupting operation. A pair of tubular oil heaters are installed to provide proper final temperature for the oil prior to atomization, and steam supply to these heaters is controlled by thermostatically actuated valves. An air chamber to dampen pressure fluctuations, when operating with the piston pump, is also placed in the supply system. All piping and valves on this system are designed for 300 psi operating pressure. A diagram of the fuel supply piping is shown in Fig. 1.

The combustion equipment on the boiler is shown in Fig. 2. It consists of two Todd "Model C-16" air registers, equipped with standard "Vee-Cee" atomizers, which operate on the return-flow principle, in which control of the quantity of oil returned to the source of supply regulates the quantity atomized. Use of this type of atomizer permits the plant to operate automatically over its full load range without requiring the usual changing of atomizer tip sizes. The registers are installed in a plenum chamber and are designed with the atomizer assembly carried in a hinged swinging door which provides ready access for adjustment and replacement of parts. Access to the boiler furnace is also available through the register door opening, thus eliminating the necessity of a complete or partial register removal or the removal of a bricked-up refractory opening in the furnace side wall.

Air for combustion is furnished at low pressure by a motor-driven constant-speed fan, the quantity delivered being controlled by adjustable louvers located on the fan inlet.

The fuel supply to the atomizers and air furnished by the blower are automatically controlled by a hydraulically operated system through a master regulator actuated by the steam pressure. The oil and air ratio is maintained over the full range of load by a regulator which responds to draft differential and oil flow. Furnace draft is maintained constant by an overfire draft regulator which actuates a damper on the boiler outlet. The furnace is of conventional design with suspended lining and an air-cooled floor, and the boiler is equipped with the usual instruments for a plant of this type and size, including a recording steam flow meter, CO_2 recorder and stack pyrometer.

Installation work was done by the Perfection Grate & Stoker Company of Springfield and Boston, Mass.

Conference Stresses Feedwater and Boiler Water Problems

Among the topics discussed at the Sixth Water Conference were the behavior of highly concentrated boiler water, cold water vacuum deaeration, boiler scale studies at 1500 psi, ion exchange water conditioning, electrolytic softening and feedwater practice in Germany. Abstracts of the papers on these subjects are here given, but space does not permit inclusion of the extensive discussion which will be available when the Proceedings of the conference are published.

THE Sixth Annual Water Conference, sponsored by the Engineer's Society of Western Pennsylvania, was held at the William Penn Hotel in Pittsburgh, Pa., on October 22–23, with a registration of over 325. A number of papers in the steam generating field were presented.

High Boiler Water Concentrations

In a paper entitled "The Behavior of Highly Concentrated Boiler Water," Messrs. Kaufman, Marcy and Trautman of the Hall Laboratories outlined the theory of the concentrating boiler water film at the steam generating surfaces, and presented experimental data on the solubility and corrosiveness of boiler water salts.

Boiler water, at concentrations shown by the usual analysis, can be considered dilute and non-corrosive, but hideout, scale formation and/or corrosion may occur when such waters concentrate. Hideout occurs when boiler water salts of relatively low solubility become concentrated in a boiling film of boiler water at a point of high heat transfer, and begin to come out of solution on the tube surface. Such precipitation of salts may not, in itself, be serious, but is an indication of a condition that may cause trouble. The sodium sulphate and phosphate in the boiler water are the usual hideout offenders, sodium chloride and hydroxide being much more soluble. In contrast to the sodium salts, those of potassium are much more soluble and hideout can be eliminated by substituting potassium salts for sodium salts in the boiler water treatment.

Corrosion within the boiler tubes may occur when the normal alkalinity of a boiler water concentrates sufficiently to destroy the protective oxide coating on the metal. The effect of a dilute boiler water, of normal composition, is to form and maintain a thin protective coating of iron oxide on the tube surface. As a boiler water concentrates, however, particularly as its alkaline constituents concentrate, a point is reached where the protective coating is dissolved and the tube metal becomes exposed to oxidation by the bonded oxygen of the water. The metal reduces the water, combining with its oxygen and liberating its hydrogen.

Concentration of a normal boiler water, sufficient to cause corrosion and hideout, is explained by the theory of the concentrating boiler water film. The water and steam in a boiler are normally at the temperature given in steam tables for the pressure involved. Locally, however, at points of poor circulation or of high heat transfer, the temperature of the water and steam may be considerably higher than that corresponding to the pressure.

Phase Rule Applied

By application of the Phase Rule, it follows that, in a constant pressure system, a local increase in temperature results in a counterbalancing increase in concentration. The extent of concentration is a function of the temperature difference set up at the hot spot, the materials present in the boiler water, their relative amounts with respect to each other, and of their limiting solubilities.

Local hot spots in a boiler circuit are possible in the upper portion of inclined boiler tubes where there is partial separation of steam from the circulating mixture, and in vertical tubes where high rates of heat transfer set up film boiling and steam blanketing. Concentration of alkaline salts in such areas often results in internal corrosion, grooving and tube failure.

Laboratory determinations of the solubility of boiler water constituents were made by determination of the vapor pressure variation, with temperature, for saturated solutions. There is a direct relationship between solubility, vapor pressure and the temperature difference between the concentrated solution and the temperature given in steam tables for the pressure involved. These data were determined for both solo solutions and mixtures of both the sodium and potassium salts. Pertinent to the corrosion problem was a curve prepared by the authors, showing concentrations of ten to twenty per cent caustic concentration attainable in boiling films under local superheat conditions of 15 to 30 deg F.

In concentrating systems, the demand for concentration is shared by all salts in solution. The presence of very soluble salts, such as sodium chloride and salts of the potassium family, greatly reduces the concentration of hydroxides at the hot spot and may prevent corrosion. When the hydroxide is associated with relatively insoluble salts that hide out easily, the burden of concentration falls on the caustic and relatively high concentrations can develop which cause corrosion and failure.

Additional experimental data on the corrosiveness of boiler water salts were obtained by establishing equilibrium conditions in a test bomb under various conditions and determining the residual pressure set up in the bomb after cooling, by the hydrogen liberated in the bomb by corrosion. The results are consistent with the theory

involved and there is little doubt but that the theory of the concentrating boiler water film will become a valuable tool in the analysis of boiler corrosion problems.

German Water Conditioning Practice

An interesting, but unscheduled, talk on "German Power Plant Water Conditioning Systems" was given by W. W. Cerna of the Hall Laboratories who was one of a group of six technical experts sent to Germany early in May by the Government to report on power plant developments and practice. Many plants were inspected and operators, chemists and consultants interviewed.

Basically, the various methods of water conditioning in Germany are similar to those used in this country. In general, German waters are hard, and in many cases are contaminated with industrial wastes. Chemical treatment is necessary and is used on a large scale.

Silica content of boiler waters in Germany is generally limited to less than 7 ppm for high-pressure operation, and silica removal systems are an important part of the water conditioning. For cold-process silica removal, a combination of magnesium chloride and sodium aluminate is used as the active reagents. Residual silica content of 1 ppm in the treated water is the usual goal. Hot-process systems for silica reduction are similar to American practice. Dolomitic lime, lime and magnesium oxide, or caustic soda and magnesium oxide are used to give a combination of carbonate hardness and silica reduction.

For high-pressure boilers, condensate feedwater systems are the usual standard, even though process steam requirements are high. Where treated makeup water is used, final softening by either hot phosphate units or base-exchange softeners is always employed. Internal phosphate treatment is universally used in German power stations.

Incidently, Mr. Cerna mentioned that at Mannheim, which was badly damaged by both air raids and artillery action, the large central station had received only minor damage. Early in the war an underground extension had been built which contained a 35,000-kw turbine-generator. Peculiarly, this underground extension suffered more bomb damage than that above ground, due to the shock transmitted to the 35,000-kw unit, through a thick concrete roof when a bomb exploded above it. The unit was put out of service for two weeks.

Vacuum Deaeration

A paper on "Cold Water Vacuum Deaeration," by Sheppard T. Powell, consulting chemical engineer, described recent developments in the degasification of large volumes of cold water by vacuum deaeration. The process is based on the fact that if a liquid is distributed in a thin film and a vacuum applied, the dissolved gases such as oxygen and carbon dioxide, will be reduced to a relatively small residual amount. Further deaeration can be obtained by multiple-stage units or secondary chemical treatment, if economically feasible.

Mr. Powell described two large-scale deaeration systems, one in Australia and one installed by the Freeport Sulfur Co. at Port Sulfur, La. At the latter plant, the deaerator was designed to deaerate about four million gallons of water per day, which was pumped through some ten miles of steel pipe line. Originally installed in 1935, without deaeration, the capacity of the line decreased 22 per cent in 129 days because of active corrosion and tuberculation in the line. Installation of a vacuum deaerator, supplemented by additional sodium sulphite treatment, corrected the corrosion and the system has been in continuous and successful operation for nearly ten years.

The purchase cost of single-stage installations can be estimated at $10,000 for a thousand gallons per minute of water treated, plus $3000 for each additional increment of 1000 gallons per minute. Operating costs depend on availability of steam or power and the completeness of deaeration desired.

Deaeration performance for a number of smaller installations described by the author, showed reduction of oxygen to values ranging from 0.2 to 0.6 milliliter per liter. Vacuum pressures vary from 25 to 28 in. of mercury, depending on the design and operation, which in turn is governed by the initial cost and operating charges.

Boiler Scale Studies

J. A. Holmes, of National Aluminate Corporation, presented an interesting paper on "Experimental Studies of Boiler Scale at 1500 Psi," which was a continuation of previous studies made under similar conditions at 800 psi. The presentation was largely pictorial with slides showing magnified deposits on a heating element under various boiler water conditions. The results of the tests indicated that magnesium in the presence of phosphate under some conditions, causes deposits. Greater amounts of organic colloid are required to condition sludge as the boiler pressure and the magnesium content of the water increases. Silica can be reduced internally in the boiler water by the addition of magnesium, but excess phosphates hinder this reaction. In general, there appeared to be a greater tendency toward scaling and deposition at 1500 psi than at 800 psi.

Ion Exchange Water Conditioning

In one of two papers on ion exchange water conditioning, W. D. Manring, of American Cyanamid and Chemical Corporation, dealt with "Demineralization of Water by Ion Exchange," and described the operation and performance of the Ionac Four-Bed System. A new development in ion exchange resin systems is the use of multiple beds which are regenerated in parallel with different solutions and then rinsed in series. At a cost of about six cents per thousand gallons for each hundred parts per million of removable salts, the advantages of the four-bed system are

1. High quality of water produced.
2. Low rinse water losses.
3. Good regeneration efficiency.
4. Chemical removal of CO_2.
5. Uniformly neutral pH of the effluent.
6. Flexibility of operation.

Use of the four-bed system reduces ion leakage and reduces the amount of sodium in the effluent to less than 8 ppm consistently throughout a run. Application of this system to small portable unit stills, gives practically complete demineralization of water for potable and other use. Such units are available with capacities of 5 to 50 gal per hr.

A second paper on ion exchange units was given by R. B. Thompson, of The Dorr Company, who discussed "Some Fundamental Factors Affecting the Design and Operation of Ion Exchange Units." After testing six-cation and three-anion, commercial exchangers, the author drew the following conclusions:

Acid-regenerated cation exchangers give 1 to 3 per cent leakage of cations through the bed, which is not readily detected by usual tests. Leakage of sodium is proportional to the strength of the exhausting solution, or in other words, with highly saline waters better acid regeneration is necessary to produce water of the same quality as from a low saline water. Factors affecting leakage are the amount of alkalinity present, the rate of flow through the bed and the quantity of regenerant used. The rate of flow in terms of cubic feet of exchanger is of more significance than the rate of flow per square foot of bed.

Anion exchangers give practically complete removal of mineral acids and their capacity depends on the strength of the raw water as well as on the acid being removed.

Of paramount importance to the performance of an ion exchange unit is the raw water analysis, as this determines the type and also the quantity of regenerant used.

Electrolytic Softening

"Electrolytic Water Softening for Industrial Purposes" was the title of a paper by R. E. Briggs of the Metropolitan Water District of Southern California. This process employs the principle of ion migration under the influence of an imposed emf. In a three-compartment cell, having porous partitions, an anode and cathode are installed in the outer compartments. Under the influence of a 2 to 6 kwhr electric input per 1000 gal of final product, dissolved salt ions migrate through the porous partitions to the anode and cathode, effecting partial demineralization of the water in the center compartment. The porous partitions allow removal of the treated water without setting up disturbing flow currents.

Part of the process is chemical in that sodium ions, migrating to the cathode, become metal sodium which unites with water to form hydroxide which in turn precipitates the hardness ions of calcium and magnesium. The sludges are filtered out and the effluent is treated to adjust pH values. Some silica reduction occurs, probably by absorption by precipitated sludges that are usually present.

The amount of softening and reduction in concentration obtained, is proportional to the ampere-hours applied per gallon of water. Four to ten volts is the operating range, operation at four volts being more efficient but having a greater initial cost of installation. Performance with an 800-ppm raw water, having 360-ppm hardness, showed reduction of hardness to less than 100 ppm and reduction of total concentration to about 450 ppm. Sulfate, chloride and silica show about 50 per cent reduction.

Efficiency of separation depends somewhat on pH conditions, and some selective separation can be obtained by stage treatment under controlled pH conditions, with intervening filtration.

(*Continued from page 38*)

ready to operate at peacetime levels if coal could be secured. The United States, which is the only source of supply for civilian coal, is shipping about 40 per cent of the amount consumed by Italy before the war.

Poland Can Export Coal

Poland previously produced about 38,000,000 tons a year; but the westward expansion of Polish borders has incorporated areas of Germany which had a pre-war output of 30,000,000 tons, and during the war the capacity of the whole of Silesia was increased. Destruction of the Polish transportation system, harbors and the limited rail service to Russia act as serious breaks to Polish coal production. The new Poland is producing at a rate of 30,000,000 tons a year, approximately 35 per cent of this coming from former German Silesia. She has agreed to provide Russia with almost a million tons a month, and has made trade agreements with Denmark, Sweden, Norway, Rumania and Hungary.

In Czechoslovakia annual peacetime production was approximately 25,000,000 tons, and coal was exported principally to Austria and Italy. Because of destruction of transportation and mines, and lack of food and clothing, production is approximately 30 per cent normal.

The Allied Nations are shipping to Greece about 20,000 tons of coal a month from South Africa and the United States, but destruction there is so great that it will take a rebuilding of the industries and railways before major quantities of coal are required.

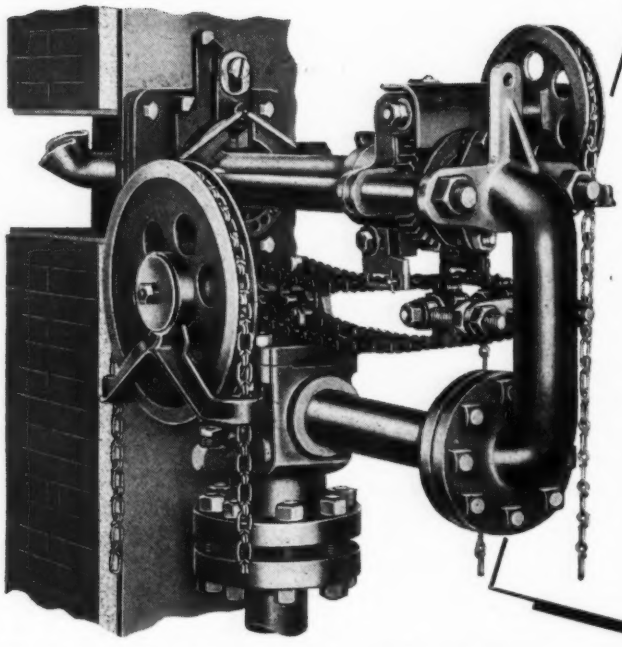
The almost complete destruction of the Donbas Basin placed Western Russia in the position of having practically no fuel supply. During the war it was necessary to ship coal by rail from the Urals to keep war industries going. Upon liberation of the Donbas Basin, in which the mines had been destroyed by the Germans, the Russians salvaged all that was possible and placed full emphasis on maximum production. The result was that they expected to operate them in 1945 at about 50 per cent of peacetime level.

The European nations that managed to keep out of the war are also in dire straits. Sweden has entered into a trade agreement with Poland for coal but as yet has received negligible supplies. The United States is now exchanging a small quantity for an equivalent tonnage of wood pulp and Swedish industries are operating on a limited schedule.

Switzerland, like Sweden, during the war continued to import coal from Germany, but with this source of supply gone, she is attempting to buy coal in world markets.

Germany needs coal but is not going to get it. In the French, British, and United States zones, a minimum of $2^1/_2$ million tons a month is required to hold German economy at the disease and unrest level. She will not receive this much coal which includes fuel for the railways, for operation of the mines, for cooking for the troops and miners, and fuel for essential hospitals. It does not include fuel for cooking or heating for the German civilian population, nor does it include fuel to operate German industry except that which is contributing its entire output to the Armed Forces.

From the foregoing, it can be seen that practically all Europe requires very substantial tonnages of coal. As to sources of supply, the United States can will and supply approximately 2,000,000 tons per month.



Bayer Gun Type Cleaner as arranged for first-pass screen tubes.

For effective cleaning of High-Temperature Zones of modern boilers

THE BAYER GUN TYPE CLEANER

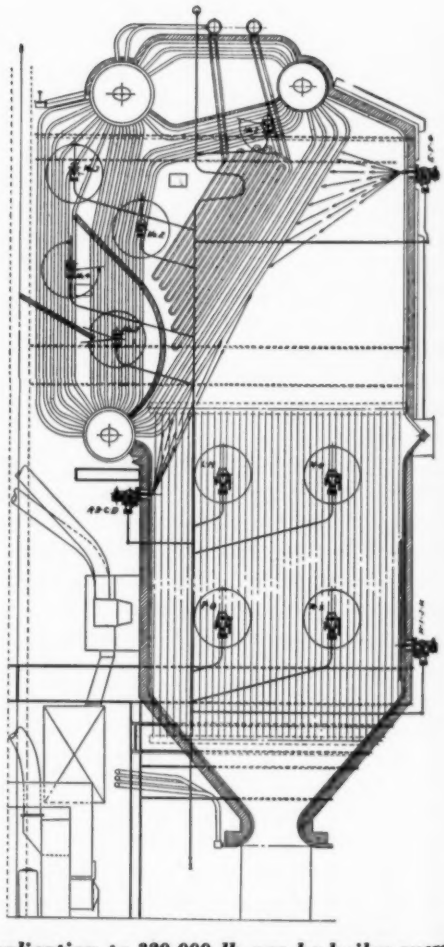
Here is a cleaner that has been developed especially for cleaning the high-temperature zones of modern boilers . . . slag screen tubes, the front row of tubes in the first pass and water-wall surfaces.

Operating engineers fully realize the importance of keeping such surfaces clean and the Bayer Gun Type Cleaner will do the job quickly and efficiently. The special mass-flow nozzles have a wide cleaning range and are easily advanced and retracted. When the nozzle is fully advanced, the balanced valve is wide open. The nozzle is rotated very slowly over the cleaning arc by means of the outer chain wheel through a worm and worm-wheel drive. When not in use, the nozzle is housed within a casing where it is out of the path of the hot gases.

Construction throughout is adequate for the most severe service conditions. The head and balanced valve body are made of electric steel. The nozzle and nozzle tube are fabricated from the highest grade of alloy available for high temperature service. Valve parts, seat, piston disc and stem are stainless steel.

In addition to cleaning high-temperature zones, this cleaner has been used very successfully for cleaning radiant-type superheaters, furnace hopper bottoms, economizers and some types of convection superheaters. When conditions require it, the cleaner may be designed for a travel of several feet.

Ask for further information on this modern method of keeping modern boilers at peak efficiency.



Application to 320,000-lb-per-hr boiler operating at 675 psi. Three gun-type cleaners at the top of the target wall and four below the mud drum clean the first pass and superheater. Water walls are cleaned by a series of gun-type cleaners.

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Ore Carrier Operates with 1450 Psi Steam Pressure

Brief abstract of a paper before The Society of Naval Architects and Marine Engineers in which the authors discuss at length the propulsion equipment and other features of the ore carrier *Venore*, designed to operate on the reheat cycle with initial steam conditions of 1450 psi, 750 F. Two bent-tube boilers supply high-, intermediate- and low-pressure turbines driving a single shaft through double-reduction gearing. The fuel economy on trial was 0.504 lb of oil per shaft horsepower per hour.

USE of 1450 psi steam pressure for main propulsion in the S.S. *Venore*, the first of several 24,250-ton ore carriers built for the Bethlehem Steel Company, was discussed in a paper by H. F. Robinson[1] and E. P. Worthen[2] before The Society of Naval Architects and Marine Engineers at its Annual Meeting this month in New York.

This vessel was designed to carry iron ore from Chile to Sparrows Point, Md., via the Panama Canal, and has 13,000 shp, permitting a cruising range of 12,000 nautical miles at 16 knots speed. It is equipped with two Combustion Engineering two-drum, bent-tube boilers with superheater, economizer, air heater, air-puff soot blowers and automatic combustion control. Steam is supplied at 1450 psi 750 F, at the superheater outlet, to propulsion machinery consisting of a high-pressure, an intermediate-pressure and a low-pressure turbine of Bethlehem design, which drives the single propeller shaft through double-reduction gearing. A steam reheater is arranged in each of the turbine receiver pipes and reheats the steam to 565 F. The turbines have four bleed points and feed heaters are installed for each bleeder. A steam cycle flow diagram is shown in Fig. 1.

Two centrifugal direct-connected, turbine-driven boiler feed pumps are installed, either of which is sufficient to handle the ship at maximum power. These turbines use high-pressure superheated steam and exhaust into the deaerator at 10 psig.

In order to insure the purity of the feed to the high-pressure boilers, it was decided that the high-pressure steam would serve only the turbines and heat-exchangers in the machinery space, and that all steam required for the galley, heating, deck machinery, fuel heating etc., would be taken from a low-pressure system completely isolated from the main high-pressure plant. Accordingly, there is installed a separate 125-psi system, steam for which is produced by a large evaporator using steam from the main boilers through a reducing valve set at 400 psi. Drains from the evaporator coils are returned to the high-pressure boilers via the deaerating feed tank.

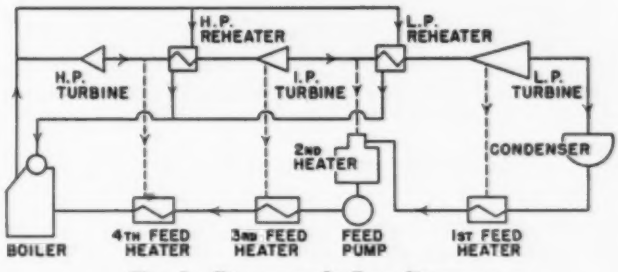


Fig. 1—Steam cycle flow diagram

Steam and drains from the auxiliaries, served by this low-pressure system, pass to an atmospheric condenser and drain into a storage tank. A feed pump takes suction from this storage tank and discharges to the low-pressure steam generator (evaporator) through a coil drain cooler which acts as a feed heater.

Single Screw Versus Twin Screws

Use of a single screw, rather than twin screws, for a vessel of this size and speed is unusual, but with the high pressure employed, superior performance is indicated. For a speed of 16 knots the estimated power for a single screw is 9900 shp and the installed maximum power (25 per cent margin) is 12,400 hp. For twin screws these powers would be 10,900 and 13,600, respectively. Hence, there is a considerable difference in the power per shaft.

[1] Naval Architect, Bethlehem Steel Company, Shipbuilding Division, Quincy, Mass.
[2] Chief Engineer, Bethlehem Steel Company, Shipbuilding Division, Quincy, Mass.

COMPARISON OF STEAM CYCLES: 425-PSI, 740-F CYCLE USED AS BASE

No.	Material	Pressure Standard for Valves	Pressure Standard for Piping	Operating Pressure, Psi	Total Temperature, F	Superheat, Deg	Type of Cycle	Fuel Rate Reduction, Per Cent
1	Carbon molybdenum	900-lb series	Schedule 160	875	840	310	Non-reheat	8
2	Carbon molybdenum	1500-lb series	See Note 2	1425	940	350	Non-reheat	13
3	Carbon molybdenum	1500-lb series	See Note 2	1660	840	229	Gas reheat	15
4	Carbon molybdenum	1500-lb series	See Note 2	1660	840	229	Steam reheat	11
5	Carbon steel	900-lb series	Schedule 120	575	840	356	Non-reheat	6
6	Carbon steel	1500-lb series	XXH	975	840	297	Non-reheat	9
7	Carbon steel	1500-lb series	XXH	1425	740	149	Gas reheat	11
8	Carbon steel	1500-lb series	XXH	1425	740	149	Steam reheat	9
9	Carbon steel	1500-lb series	XXH	1425	740	149	Double steam reheat	11

NOTES:
1. Gas reheat to initial total temperature in all cases.
2. Coast Guard rules require piping thicknesses in excess of double extra heavy for Cycles 2, 3 and 4.

A high-pressure steam cycle of 1450 psi cannot be employed efficiently for powers of less than 9000 shp with existing turbine designs, due to the larger proportionate leakage associated with the short blade lengths. A 6800-hp turbine is also less efficient than a 12,400-shp unit

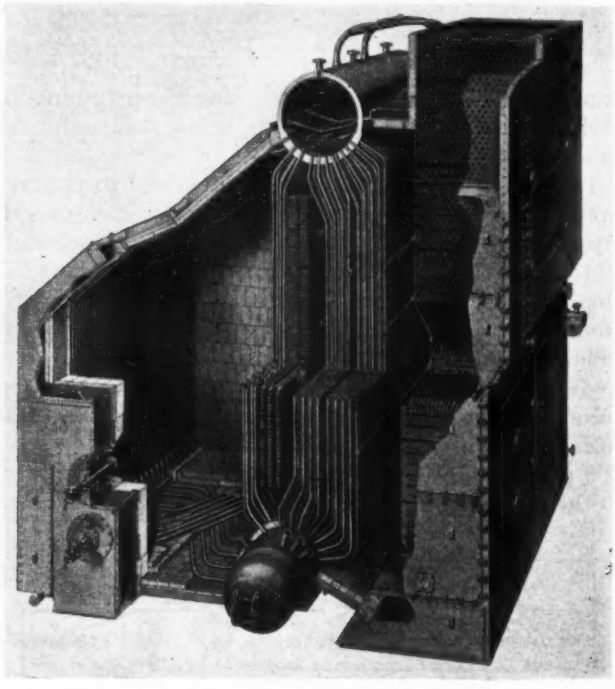


Fig. 2—Cut-away view of 1450-psi boiler

operating at the same steam pressure. Moreover, there are other factors in favor of the single-screw design. Hull efficiency is poorer with twin screws, due to the propellers being outside the wake belt, and power required for appendages is greater. Partly offsetting this is some gain in propeller efficiency with twin screws, but a summation of all the factors mentioned indicated a net saving of about 17 per cent in oil consumption per nautical mile with the single-screw arrangement.

Comparison of Steam Cycle Conditions

The authors compared the relative advantages of several steam cycles that were considered. These are shown in the accompanying table. It was pointed out that the chief advantages of cycle 9, as adopted, was its simplicity from both a design and an operating standpoint. No innovations in turbine or boiler design were required and due to the relatively low steam temperature no special control devices were necessary. Furthermore, with the steam temperature selected, namely 750 psi, it was possible to employ carbon steel for piping, valves and fittings. This was an important consideration, for during the war carbon molybdenum steel was a critical material. Also, with the exception of conditions for Cycle 1, the Coast Guard Rules require piping thicknesses in excess of those that are readily available and special piping would have had to be manufactured with thicknesses in excess of "double extra heavy." This would have been a serious limitation during war time.

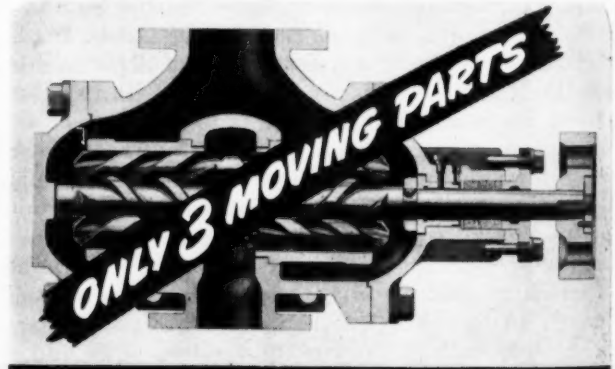
The steam reheaters may be considered as simply additional equipment to improve efficiency and to eliminate moisture in the last stages of the low-pressure turbine. The turbines may be operated up to about 5000 shp without the use of the reheaters and for brief periods up to full power. Furthermore, such a ship is particularly well suited to the use of high pressure as the power is high, the voyage long and the periods in port brief. The need for efficient machinery increases with the power and with the length of time the vessel is at sea, since these conditions increase the ratio of fuel costs to overall operating expense.

Comparison of machinery weights was made with a recently built single-screw tanker of similar power and speed, the chief difference being that the tanker employs steam at 425 psi, 740 F. As there are more cargo-oil pumps and ballast pumps on the tanker than on the ore carrier *Venore*, these were not included in the comparison which showed the propulsion machinery of the latter to be only about 2 per cent heavier and the fuel rate per shaft horsepower to be about 14 per cent better.

Performance

On the builder's run and subsequent one-day official trial on July 17, 1945, no difficulties were experienced with the high-pressure machinery. The fuel-oil economy on the official three-hour normal power endurance run averaged 0.504 lb of oil per shaft horsepower per hour or about 1 per cent better than the expected design figure. The ship's trial speed, fully loaded was 16.8 knots. Heat balance calculations showed a boiler efficiency of 87.5 per cent when burning 18,500 Btu oil.

The vessel is now carrying approximately 24,150 tons of ore from Cruz Grande, Chile to Sparrows Point, Md. with a sea speed of 16 to $16^1/_2$ knots.



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I MOVE OIL

Central Station Power Expansion in Metropolitan (New York) Area

AT A meeting of the A.S.M.E. Metropolitan Section on October 17, expansion in central station steam plant capacity serving New York City was discussed in two-papers—one by R. F. Brower of the Consolidated Edison Company and the other by William Welch, Jr., of the Long Island Lighting Company. The subject was presented from the standpoints of load trends, the influence of operating requirements on the design of new equipment now on order or under construction, and a description of some of the design features of this equipment.

The present expansion of the Consolidated Edison Company's capacity, according to Mr. Brower, does not represent a post-war program, but instead, was begun some ten years ago and was delayed because of war conditions. It is now about 50 per cent complete.

The Edison system is served by five principal stations, strategically located as to load demand: They are Waterside Nos. 1 and 2, of 411,000 kw net capability, Hudson Avenue-Gold Street (Brooklyn) of 840,000 kw, Hell Gate of 434,000 kw net capability, East River of 259,000 net kw and Sherman Creek of 205,000 net kw. There are also three smaller stations tied into the Edison system. These are the Glenwood Station at Yonkers of 52,000 kw, built by the New York Central Railroad but later acquired and expanded by the Edison Company; the Port Morris Station of 50,000 kw under lease from the New York Central Railroad; and the Long Island City Station of the Pennsylvania Railroad also under lease by the Edison Company.

Hell Gate Extension

An addition, now under construction at Hell Gate, consists of two 975,000-lb per hr, 900-psi operating pressure, 950-F high-pressure boilers and a 65,000-kw topping turbine, the exhaust from which will supply 135,000 kw of existing low-pressure capacity. This will bring the capacity of the station up to approximately 630,000 kw.

At Sherman Creek a second 1,000,000-lb per hr 1725-psi high-pressure boiler and another 50,000-kw topping turbine-generator are going in. The expected ultimate capacity of this station will be 400,000 kw. The first topping unit, installed a year and a half ago, with its proportionate share of low-pressure equipment is operating at an overall heat rate of less than 12,500 Btu per kwhr compared to a heat rate of over 22,500 Btu at which the plant operated before modernization.

Waterside No. 1 will later be expanded by the removal of 53 old low-pressure boilers and the installation of two topping units which will increase the combined capacity of Waterside Nos. 1 and 2 to about 650,000 kw.

The Hudson Avenue and Gold Street Stations in Brooklyn, which are adjacent and considered as a unit, will likely be increased at some future date to an ultimate capacity of 880,000 kw by the installation of topping units in Gold Street.

Except for a heavy aluminum plant load, during the war, which has now been discontinued, the Consolidated Edison Company system has few large industrial loads; its load being made up mostly of commercial and residential customers. However, during the last 15 years the character of the load curve has changed. This has had some effect on the type of firing equipment required. That is, in 1929 the load curve had short-time peaks for which stokers were adequate; whereas in 1944 the average load from 9 a.m. to 6 p.m. on the heaviest load day was about 92.5 per cent of the maximum one-hour load. For this type of load pulverized coal-burning equipment is better adapted. Indications point to a continuously increasing load with long-duration peaks which necessitates increasing the continuous boiler ratings. Therefore, the program has stressed boiler plant capacity more than turbine capacity. The annual maximum load at present is about two million kilowatts compared with 1,300,000 kw in 1935.

Mr. Welch described the characteristic load of the Long Island Lighting Company System which is predominantly residential with summer and winter peaks. Over the last 20 years it has increased sevenfold; and during the war the industrial load practically doubled, accounting for about 35 per cent of the total. The average load factor during this period ranged from 60 to 65 per cent. While the end of the war affected the industrial load to the extent of about 5 per cent, accompanied by an indicated drop in load factor to about 50 per cent, it is anticipated that new residential and commercial demand will soon more than offset the decrease in load.

Extension to Glenwood Station

The speaker then told of the extension to the Glenwood Landing steam station, now under construction. This consists of a 400,000-lb per hr, 400-psi, 750-F, C-E bent-tube boiler designed for operation over a particularly wide range in output, from 80,000 to 400,000 lb per hr and a wide range in fuel characteristics. This unit will be tangentially fired with pulverized coal and be adapted to oil firing, if desired. Pulverized coal will be supplied from the existing storage system, which is being extended and additional feeders installed. Vertically adjustable burners will assist in superheat control. The furnace will be of the dry-bottom type and the unit will have an air preheater but no economizer. A complete combustion-control system, interlocks on fans and feeders, air-operated soot blowers, and a mechanical system of fly-ash arresting will be incorporated. Steam from the new unit will supply a

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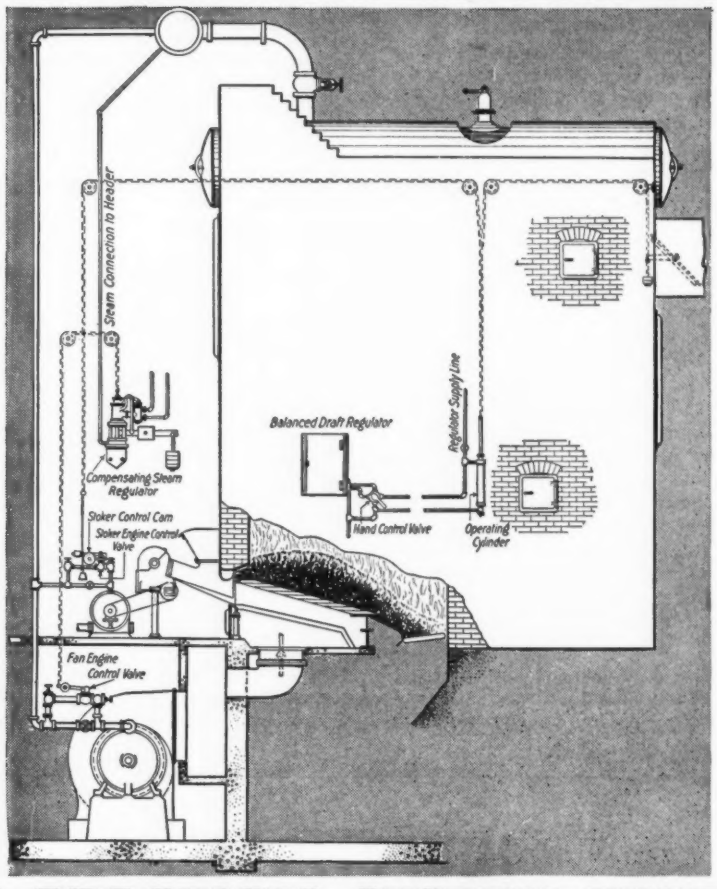

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40,000-kw condensing turbine-generator.

This installation will complete the Glenwood Landing Station. To accommodate any further increase in load, when the time comes, it is contemplated to build a new 1250-psi, 950-F station arranged ultimately for five 40,000-kw turbine-generators of which only one would be installed initially.

In the discussion that followed presentation of these two papers a representative of the Public Service Electric and Gas Company of New Jersey told of a new high-pressure unit going into the Essex Station. This will consist of a 900,000-1,000,000-lb per hr, 1250-psi, 950-F boiler and a 100,000-kw turbine-generator. To make room for the new units four 225-psi boilers and a turbine-generator installed in 1918 have been removed.

Electric Boiler Operates With Water of Low Specific Resistance

In the autumn of 1944 one of the largest electric boilers in Switzerland was put in service in a cellulose plant. Interesting features, as described by A. Strub in *The Brown Boveri Review*, Vol. 32, No. 4, are the nature of the water employed and the earth fault protection device.

The boiler is of 12,000 kw output, directly connected to a 10,000-volt three-phase system and has a rated evaporation of 37,500 lb of steam per hour at 200–225 psi. It is of the water-jet high-voltage design.

Operating conditions render it impossible to recover the condensate, so the boiler has to be fed with chemically treated water which is taken from the same water-softening plant that supplies the fuel-fired boilers. The raw water is taken from the river and contains 7 to 10 degree hardness. Lime-soda is employed for softening and trinatrium phosphate for elimination of the residue. This treatment causes a 60 per cent reduction of the specific resistance of the water at 68 F and at the working temperature of 392 F the boiler operates with a specific resistance of only 75 to 85 ohms per centimeter.

The muddy water which is continuously removed in order to avoid the formation of saliferous matter, is redirected into the water-softening plant; and its heat is utilized for heating the raw water. Also, a large part of its chemical content is used for softening, the remainder being allowed to run off to reduce the concentration.

Furthermore, the boiler is fitted with a new kind of earth-fault protection device, consisting of a so-called cable-current transformer with a protective relay which acts on the boiler switch. During a single-phase earth fault, an earth current, which may assume large proportions, flows from the earthed neutral point of the boiler to the point of fault. As long as no such fault exists the sum total of all currents in the three-phase lead to the boiler is zero, and no current flows in the cable current transformer surrounding the cable lead. However, as soon as an earth fault occurs the balance is upset and the differential current, which flows through the cable current transformer, causes the relay to respond and the main switch is operated.

A.S.M.E. ANNUAL MEETING PROGRAM

THE Annual Meeting of the American Society of Mechanical Engineers will be held at the Pennsylvania Hotel, New York, November 25–29, inclusive. The first day, Sunday, will be given over to Council meetings and Monday through Thursday to technical and general sessions in the mornings, afternoons and evenings, with several luncheons and dinners at which prominent individuals will speak. In addition to technical subjects much attention is being given to production and lessons learned from the war, as well as aviation.

The annual banquet is scheduled for Tuesday evening at the Hotel Astor with President Alex D. Bailey as toastmaster and Lieutenant-General Ira C. Eaker as the principal speaker. Among the more important luncheons, from the standpoint of general interest, will be one on Wednesday at which the speaker will be Dr. Vannevar Bush, Director of the Office of Scientific Research and Development, who is widely known as one of the leading scientists in the development of the atomic bomb.

The tentative program calls for 60 technical sessions at which over 150 papers will be presented. Only those having particular bearing on fuels and the power field are here listed as follows:

Monday, 9:30 a.m.

"Free Heat Convection Through Enclosed Plane Gas Layers," by Max Jakob, Armour Research Foundation.

"The Effect of Heat Loss on the Performance of Exchangers With Interconnected Walls," by P. R. Trumpler, M. W. Kellogg Company.

"Estimating and Evaluating Army Fuel Requirements," by R. E. Biller, Corps of Engineers, U. S. Army.

"Example Section for a Smoke Regulation Ordinance," by J. F. Barkley, U. S. Bureau of Mines.

"Graphitization of Steel Piping," a report by the Joint A.S.T.M.-A.S.M.E. Research Committee on Effect of Temperature on the Properties of Metals.

"Co-ordinated Data on Viscosity of Lubricants at High Pressures," by M. D. Hersey, Massachusetts Institute of Technology.

Monday, 8:15 p.m.

Panel on the High-Pressure, Controlled Forced-Circulation Montaup Boiler.

"Operation of Montaup Boiler," by G. U. Parks, Montaup Electric Company, Frank S. Clark, Stone & Webster Engineering Company, and W. S. Patterson, Combustion Engineering Company.

"Instrumentation of Montaup Boiler," by E. B. Powell, Stone & Webster Engineering Corporation, and W. D. Bissell, Montaup Electric Company.

"Special Problems Investigation," by B. J. Cross, Combustion Engineering Company.

"Feed Treatment," by R. E. Hall, E. P. Partridge and W. W. Cerna, Hall Laboratories.

"A New Method of Pulverizing and Drying Coal," by A. D. Singh, Institute of Gas Technology, Chicago, and J. I. Yellott, Director of Research, Locomotive Development Committee.

"German Production of Synthetic Liquid Fuels," by W. C. Schroeder, U. S. Bureau of Mines.

Tuesday, 9:30 a.m.

"A Velocity-Modified Temperature for the Plastic Flow of Metals," by C. W. MacGregor and J. C. Fisher, Massachusetts Institute of Technology.

"Stresses in Rotating Disks at High Temperatures," by A. S. Thompson, Westinghouse Electric Corporation.

"Stress Rupture Characteristics of Various Steels at 1200 F," by J. T. Agnew, G. A. Hawkins and H. L. Solberg, Purdue University.

Tuesday, 2:30 p.m.

"Effect of Viscosity on Centrifugal Pump Performance," by Arthur T. Ippen.

"Rotary Pump Theory," by Warren E. Wilson.

"A Comparison of Operation of Forced- and Natural-Circulation Boilers," by G. F. Ross and Leonard Wilkins, Koppus Company.

"Effect of Flow Conditions in Large Ducts on the Performance of Inertia Cinder Catches," by E. W. Bullock, Fly Ash Arrestor Corporation, and W. B. White, Consolidated Edison Company of New York.

"Compression Distillation," by Allen Latham, Jr., Arthur D. Little, Inc.

"The Control of Fouling Organisms in Fresh- and Salt-Water Circuits," by John G. Dobson, Wallace & Tiernan Products, Inc.

Wednesday, 2:30 p.m.

National Research Program—"Research Developments for the A.E.F.," by Major-General B. W. Chidlaw; "Research Development Requirements for the Navy," by Rear Admiral Harold G. Bowen; and a paper by Dr. W. F. Durand, National Research Council.

Railroad Fuels—"Future Developments in the Use of Coal in Railway Motive Power," by K. A. Browne, Chesapeake & Ohio Railway Company; "Locomotive Fuel From the Coal Man's Viewpoint," by C. F. Hardy, Appalachian Coals, Inc.; "Utilization of Coal in the Locomotive," by A. A. Raymond, New York Central Railroad; and "Air Supply to Locomotives," by R. A. Sherman, Battelle Memorial Institute.

Wednesday, 8:15 p.m.

Marine Power Meeting

"Symposium on Reducing Losses in Power Generation and Consumption." Speakers: H. D. Harkins, E. I. du Pont de Nemours & Company; Frank R. Bradley, Forstmann Woolen Company; O. F. Campbell, Sinclair Refining Company; J. R. Michel, Commonwealth Edison Company; and D. C. Weeks, Consolidated Edison Company of New York.

Thursday, 9:30 a.m.

"Sliding Friction Under Extreme Pressures," by S. J. Dokos, Westinghouse Electric Corporation.

"The Influence of Film Journal Bearings on the Stability of Rotating Machines," by A. C. Hagg, Westinghouse Electric Corporation.

"Properties of Steam at High Temperatures," by John I. Yellott, Eric Lype and Morris Friedman.

"Details of Gas-Turbine Design," by R. A. Riester and F. O. Hennig, Elliott Company.

"The Elliott-Lysholm Compressors," by W. A. Wilson and J. W. Crocker, Elliott Company.

Thursday, 2:30 p.m.

"The Elbow Combustion Chamber," by M. A. Mayers and Wane W. Carter, Elliott Company.

"The Escher Wyss AK Closed-Cycle Turbine," by Curt Keller, Escher Wyss, Zurich, Switzerland.

Thursday, 8:15 p.m.

Symposium on "Automatic Control of Marine Power Equipment."

New Officers of American Welding Society

At the Annual Meeting of the American Welding Society, held in New York on October 18, Dr. Wendell F. Hess, Professor of Metallurgical Engineering at Rensselaer Polytechnic Institute, was elected president for the year 1945–46.

Other officers elected at the time were Harold O. Hill of Bethlehem Steel Company, first vice president, and George N. Sieger of the S-M-S Corporation, Detroit, as second vice president. The new directors at large, elected for a term of three years, are C. M. Underwood, of Northern Ordnance, Inc., Minneapolis; Dr. A. B. Kinzel, vice president of the Electro-Metallurgical Co. and of the Union Carbide and Carbon Research Laboratories; Charles H. Jennings of the Westinghouse Research Laboratories; and R. D. Thomas, president of the Arcos Corporation, Philadelphia.

Honorary Membership was conferred on Dr. D. S. Jacobus, former president of the Society and former chairman of the A.S.M.E. Boiler Code Committee; also, on H. H. Deppeler, chief engineer of the Metal & Thermit Corporation, and on H. C. Boardman, research engineer for the Chicago Bridge & Iron Co. The Society's Lincoln Medal was awarded to Leon C. Bibber, welding engineer of the Carnegie-Illinois Steel Corporation. Dr. Samuel L. Hoyt of Battelle Memorial Institute delivered the Adams Lecture, dealing with the selection of steel for welding and the desirability of studying design, welding methods and materials in applications to outside structures.

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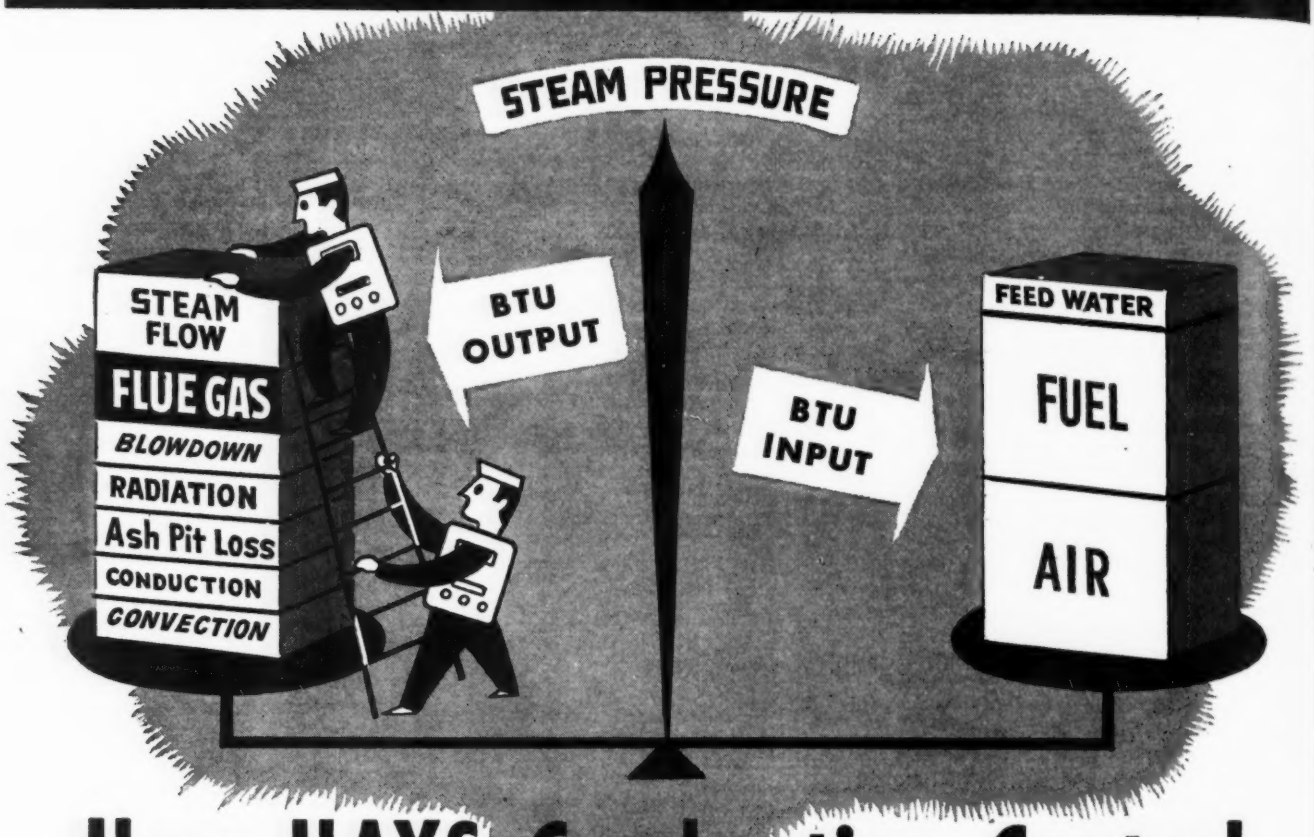

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St. Lawrence Project Again Being Urged

Bipartisan support, backed by the urge of President Truman, has again sprung up in Congress for action on the long dormant St. Lawrence waterway and power project. First proposed as a navigation project under a treaty with Canada, approval failed in 1928 and again in 1934. It again came to the fore as a war project, but the materials and labor situation, together with the estimated time required for construction, prevented definite action.

Its sponsors, sensing inability to secure a two-thirds vote in the Senate, as is required for treaty ratification, are now seeking to secure approval by statute requiring only a majority in both Houses of Congress. Its opponents are insisting that the agreement be considered as a treaty. Recently, upon representations by Governor Dewey, the President gave assurance that the power rights involved for New York State would be respected.

Several bills are now pending in Congress, dealing with the project, but it is anticipated that if they are returned to the Commerce Committee, instead of being acted upon by the Foreign Relations Committee, as is necessary for a treaty, that they will encounter much resistance. Opposition to the measure springs from several sources that would be adversely affected.

Electric Output Declines

The production of electric energy for public use during the month of September, according to the Federal Power Commission, totaled 17,015,674,000 kwhr which represented a decrease of 8.1 per cent from September 1944 and was the lowest monthly production since April 1943. The combined utility and industrial production of electricity, the latter based on reports from 800 plants generating about 85 per cent of the total industrial output of electricity, is given as 20,739,154,000 kwhr which was 8.5 per cent less than that of September 1944.

The total production of electricity for public use for the twelve months ending September 30, 1945, was 226,879,650,000 kwhr which represented a decrease of about 1 per cent from the preceding twelve months.

Reports received during October indicate the combined capacities of central station electric generating plants to total 49,864,827 kw.

Cochrane Acquired by Group of Employees

Cochrane Corporation of Philadelphia, manufacturers since 1863 of steam power plant and industrial equipment, has been acquired by a group of men long associated with the company in the engineering and sales divisions. The new corporation will be managed and operated by its owners. T. E. McBride was elected president and the following men named as vice presidents: C. E. Joos, Apparatus Division, V. A. Rohlin, works manager, A. E. Kittredge, chief engineer and E. S. Daugherty, Heater Division. The Board of Directors includes H. E. Sibson, for many years the company's general sales manager and W. V. Sauter of Philadelphia. There will be no change in the Cochrane line or sales policies, nor in the sales representation of the Company.

Midwest Power Conference to Resume

The Annual Midwest Power Conference which was cancelled last spring in deference to the wishes of the Office of Defense Transportation, will be resumed in 1946 and is scheduled for April 3–5 at the Palmer House, Chicago. It is understood that part of the program that had been arranged for the cancelled conference will be carried through and supplemented by papers dealing with current problems.

R. M. Hatfield Becomes Assistant General Sales Manager of Combustion Engineering

Robert M. Hatfield has resigned as Deputy Vice Chairman of the War Production Board to become Assistant General Sales Manager of Combustion Engineering Company.

A mechanical engineering graduate of Purdue University, Class of 1932, Mr.

Hatfield came with Combustion Engineering Company in 1934 as a student engineer, subsequently serving in the Service and Erection Department, the Proposition Department and then as sales engineer in the Cleveland Office. In 1942 he went to Washington as chief of the Boiler Section of the Power Branch, WPB, under J. E. Krug and later became Director of the Production Scheduling Division.

He resigned from WPB in May 1944 to accept a commission in the Navy, and in November of that year was assigned back to WPB to take charge of the Navy repair parts program. Last April he was placed on inactive status by the Navy to become Deputy Vice Chairman for Production of WPB which position he held until the War Production Board was abolished on November 2, 1945.

Mr. Hatfield is a member of the A.S.M.E. and a registered Professional Engineer in the State of Ohio.

Coal Stocks Decline

The Solid Fuels Administration reports, under date of November 6, that bituminous coal stockpiles are the lowest in five years. The loss of more than 17,000,000 tons of soft coal production during the work stoppage from September 21 to October 17 seriously depleted the stockpiles of industrial consumers and gravely retarded shipments to the upper Great Lakes. Moreover, occurring at the outset of the heating season, this loss has also complicated the shipment of bituminous coal to retail dealers.

Offsetting to some degree the depletion in stocks, was a 10 per cent reduction in industrial consumption during September compared with the same month last year.

During the week ending October 27, the first full week of production following the end of the supervisory strike, the bituminous coal output approximated 12,130,000 tons which, however, was under that of the corresponding week last year.

For the calendar year to October 27, the total output was approximately 469,710,000 tons, representing a decrease of 9.6 per cent from that of the preceding comparable period.

Personals

Frank W. Martin has severed his connection with the Iowa Ordnance Plant to become associated with the Stanley Engineering Company, Muscatine, Ia. Prior to his war work Mr. Martin was engineer of public utilities in Hinsdale, Ill., and before that was associated with Sargent & Lundy, consulting engineers, Chicago.

Dr. Hobert C. Dickinson, chief of the Heat and Power Division of the National Bureau of Standards, retired on October 31 after more than 42 years of service with that body.

Frederick P. Brand, formerly chief engineer of W. N. Best Engineering Company, has lately become chief engineer of International Combustion Corporation, New York, successor to Bilanx Co. manufacturer of industrial oil burners, traps, steam separators, etc.

W. A. Elliott has recently been elected president of the Elliott Company, Jeannette, Pa. He was formerly executive vice-president of that company.

George H. Miels has been elected president of Albert Kahn Associated Architects and Engineers, Detroit, to succeed the late Louis Kahn. **Sheldon Marston** succeeds Mr. Miels as executive vice-president.

Lynn Sawyer has been advanced from general manager of the Pump Division of the Byron Jackson Company to vice-president.

Henry F. Dever has recently been elected president of the Brown Instrument Company, Philadelphia, succeeding **Charles B. Sweatt** who will now devote his entire attention to the Minneapolis-Honeywell organization.

John W. Laverack, formerly vice-president and treasurer of The Dampney Company of America, has been made president, succeeding **Clarence J. Hunter** who becomes Chairman of the Board and technical director for research and development.

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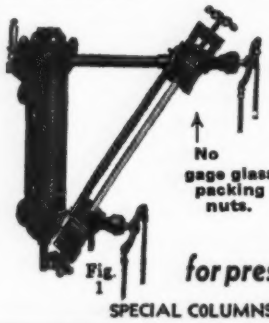

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Fig. 1

Water Columns HIGH & LOW Alarm

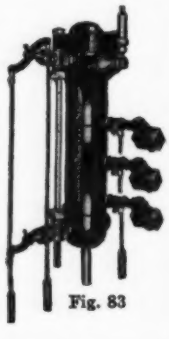

Fig. 83

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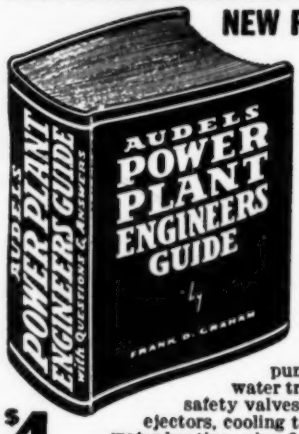

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REVIEW OF NEW BOOKS

Any of the books here reviewed may be secured through Combustion Publishing Company, Inc., 200 Madison Ave., N. Y.

Marine Engineers' Handbook

Edited by Professor J. M. Labberton, Lt. Comdr., U.S.N.R.

This handbook is designed by the publishers as a successor to Sterling's Marine Engineers' Handbook, once the "Bible" of the marine engineering profession. The work has been practically rewritten and is as modern and up-to-date as the ships now under construction.

The handbook is a compilation of the work of sixty-three specialists under the editorship of Professor J. M. Labberton. The material on engineering fundamentals has been reprinted from Mechanical Engineers' Handbook with the cooperation of Professor Lionel S. Marks.

While principally a designer's and technical student's handbook, the operating engineer will find a considerable amount of helpful information, particularly in the section on boilers.

The field is thoroughly covered with sections on engineering fundamentals, hull design and construction, marine power generation, boilers of various types, oil firing and handling turbines, steam engines, internal combustion engines, propulsion, auxiliaries, deck machinery, heating and ventilating, electrical engineering, refrigeration, tests and ship trials. The subjects are well covered from the basic theory and equations, and amplified with design data, charts, curves, descriptions and construction details.

It is unfortunate that this book was not available at the start of the war shipbuilding program and when so many young men were beginning their training in the marine field.

The handbook contains 2013 pages, size $4^1/_2 \times 7$ in red imitation leather binding. Price $7.50.

Boiler Room Questions and Answers

By Alex Higgins

The need for a reliable and up-to-date book on boiler room practice (and of particular merit for those men who are studying for licenses or certificates as operating engineers) has been adequately met in this volume by Alex Higgins. Parts of the book have already appeared in the pages of *Power* magazine—and this fact may account for the fine quality of the many illustrations which support the test.

The Question and Answer form is excellent and the 26 chapters comprise a comprehensive review of typical examination questions on the essential principles of design, construction and operation of boilers and boiler room accessories. The Answers are couched in simple terms and offer the candidate for a license an excellent example of how to handle the questions posed to him in his written examination.

The book contains 139 pages, size $8^1/_2 \times 11$, and includes a 5-page index. Bound in stiff black buckram. Price $3.00.

Ball and Roller Bearing Engineering

By Dr. Arvid Palmgren

SKF Industries, Inc., are the publishers of this 270-page book which is intended to serve as a fundamental text on all phases of bearing applications to industry. First copies of the book will be sent by SKF to the heads of leading corporations, technical schools and colleges and libraries in principal U. S. cities. Later editions will be sold at cost by the Company for students and others interested in bearing studies.

The book contains some 900 drawings and tables. Radial and thrust bearings are discussed comprehensively in Chapter I together with data on dimensional proportions, running accuracy and tolerances of each type.

The second chapter, is devoted to theory and calculations on such subjects as the nature of rolling resistance, friction torque, friction coefficients, stresses and deformations, load distribution, motion and inertia. Other chapters deal with studies in the carrying capacity of ball and roller bearings, bearing selection, design of bearing applications, mounting and dismounting, lubrication and maintenance and bearing failures. The final chapter is made up of tables, conversion values and a description of symbols and abbreviations.

Temperature Measurement

The Power Test Codes Committee of the A.S.M.E. has issued a 17-page supplement dealing with temperature measurement by resistance thermometers. This forms one chapter of Part 3 of the work by the Committee on Instruments and Apparatus, which when completed will consist of twenty parts.

Following a general discussion of resistance thermometers, including both their advantages and disadvantages, the text takes up in order the platinum-resistance, nickel-resistance and copper resistance types; forms of indicating and recording, such as the balanced bridge, deflection methods and the potentiometer method; and then devotes space to information on installation, precautions for the measurement of gas temperatures, and calibration.

The price of the pamphlet is 80 cents, with a 20 per cent discount to A.S.M.E. members.

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CATALOGS & BULLETINS

Crushers

The American Pulverizer Company has issued a new illustrated bulletin featuring the American Rolling Ring and Hammermill Crushers, Grinders and Shredders. Crushers for metal turnings, coal, stone and a wide variety of friable, semi-abrasive and fibrous materials are described. The crusher size, horsepower, speed, weight and floor space required are charted for coal, limestone and metal turnings at specified capacities. The chart shows specifications for bituminous coal as well as production for domestic stoker sizes or commercial screenings.

Demineralizers

The process of preparing clear water, the equivalent of commercially distilled, by ion exchange is described in Cochrane Corporation's new Bulletin 4181—"Cochrane Demineralizers." This new method of preparing clear water for process offers opportunities of economies and improved products wherever there is a need for mineral-free water. The bulletin describes the process in simple language, accompanied by illustrations and chemical reactions of the ion exchange process.

Econotherm Steam Generator

The C. H. Dutton Company has issued a folder dealing with its new Econotherm Steam Generator, which is a completely self-contained fully automatic unit designed for oil or gas firing, 150 hp. A three-color illustration shows the path of flue gas travel through three passes, its induced draft principle and the Dutton fast-firing Rotary Combustion feature.

Extraction Steam Heaters

The Griscom-Russell Company has just prepared an informative 16-page bulletin (No. 278) which describes and illustrates extraction heaters of both horizontal and vertical types for high, medium and low pressures. Operation and construction are graphically presented in numerous cross-section diagrams, and many halftones illustrate equipment and equipment installations. Advantages described include the G-R visible pressure seal of breech-block heads, self-adjusting compression ring gaskets, partition pass plates to prevent leakage between passes without use of stay bolts, enveloping steam baffle which permits cross-over temperatures, and removable air baffle with subcooling action.

pH and Chlorine Control

W. A. Taylor & Company has published a completely revised edition of its 88-page combination handbook and catalog. The book contains both simple and technical explanations of the meaning of pH control; specific discussions of the application of various control methods to 35 industries, such as pH, ortho and poly phosphates, nitrates and silica in boiler water and ammonia in steam condensate; the precautions to be observed in making determinations; and descriptions of all Taylor outfits, including the new Nitrate and Poly Phosphate Comparators.

Tachometers

The George Scherr Company announces its new precision hand tachometers which operate on the centrifugal principle. To change speeds, Scherr provides a knurled ring for speedy shifting. The four models are: Model A from 30 to 12,000 rpm, B from 45 to 18,000 rpm, C from 60 to 24,000 and D from 120 to 48,000 rpm.

Scherr Tachometers gain their extreme precision from the fact that each dial is individually calibrated for each instrument. The finest results may be obtained and revolving shafts can be measured as close as 1 revolution per minute. In the Model A, the hand reads to 1 rpm and fractions of one revolution may be estimated. In the 100 to 400 range each graduation shows 5 revolutions, in 300 to 1200 ten revolutions, in the 1000 to 4000 range each line is 50 revolutions while in the 3000 to 12,000 range each graduation is 100 revolutions. Attachments are also provided to give feet per minute.

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